CONSUMER ATTITUDE AND PURCHASE INTENTION TOWARDS PROCESSED MEAT PRODUCTS WITH NATURAL COMPOUNDS AND REDUCED NITRITE

Yung Hung, Wim Verbeke

Department of Agricultural Economics, Ghent University, Coupure Links 653, B-9000 Ghent, Belgium

Abstract – This study investigates consumer attitude and purchase intention towards meat products with added natural compounds and reduced nitrite content (wNCrN). Cross-sectional data were collected in Belgium, The Netherlands, Italy and Germany (n=2057). Consumers generally expressed favourable attitudes and purchase intentions. Based on these two criteria, four consumer segments were identified: "enthusiasts", "accepters", "half-hearted" and "uninterested". Purchase intention associated positively with: attitude towards processed meat products wNCrN; preference for natural over chemical additives in food including meat; perceived harmfulness of chemical additives; risk importance; attitude towards innovation in food; general health interest; educational level; and consumption frequency of processed meat products. Consumers from Italy and Germany had a lower level of purchase intention compared to the ones from Belgium. These results enable the planning of product development and marketing communication strategies tailored for specific target segments.

Key Words – Additives, Health, Marketing

I. INTRODUCTION

A causal relationship between over-consumption of processed meat and risk of colorectal cancer was recently pointed out in a scientific report wherein experts recommend consumers to limit red meat and avoid processed meat consumption [1]. Alongside the consecutive waves of meat safety scares [2], the recent debates about the health consequences of processed meat products have made its production and consumption a controversial issue [3]. Owing to the trend of increased consumer demand for convenience, processed meat products remain important in the human diet despite these negative publicities [4]. Therefore, the development of improved meat products based on scientific knowledge is topical and offering potential benefits for both public health and processed meat marketing.

Product reformulation is a way to improve processed meat products whereby the content of potentially unhealthy ingredients and nutrients is reduced [5]. Nitrite is a preservative commonly present in processed meat products, processed meats were found to be associated with possible carcinogenic risks in epidemiological studies [6]. Meanwhile, natural compounds present in fruits and vegetables (phytochemicals) were proposed to be a suitable candidate for partially or completely replacing nitrite. These natural compounds are bioactive and known to have health-promoting efficacy [7], to exhibit strong antimicrobial activities [8], and to possess substantial anti-carcinogenic and anti-mutagenic properties [9]. Adding natural compounds to processed meat products can potentially exert protective effects on the human gut by reducing the amount of carcinogenic N-nitroso compounds formed and prevent the induction of oxidative genetic damage [7, 9]. This concept of new meat products with natural compounds and reduced nitrite (henceforth, "new meat products wNCrN") can be a promising solution to improve both the actual healthiness and the health image of processed meat products.

However, consumer acceptance cannot be taken for granted as they often express uncertainty about the health impact of new or functional food products [10, 11], *e.g.* due to the different perceptions regarding the derived health benefits [12]. Consumer perception of the new meat products wNCrN is an important determinant of their future consumption which can largely influence the meat industry's competitiveness [13]. Hence, this study aimed to investigate consumer attitude and purchase intention for new meat products wNCrN, to identify market segments based on interest and to elucidate how this purchase intention is associated with various personal characteristics.

Several personal characteristics were selected based on literature, including five consumer

characteristics such as attitudes towards the new meat products wNCrN, attitudes towards meat products with chemical additives, involvement in meat products (*i.e.* the perceived personal interest or importance evoked by processed meat products in relation to consumers' enduring or situation-specific goals) [14], domain specific innovativeness (*i.e.* predisposition to buy new food products) [15], general health interest (*i.e.* orientations towards the healthiness of food and dieting behaviour) [16]; as well as a series of socio-demographics such as age, gender, educational level, and country of origin.

II. MATERIALS AND METHODS

Study design and sampling

Data were collected in December 2014 through a cross-sectional quantitative online survey with samples representative for age, gender and region in four European countries: Belgium (BE, n = 532), The Netherlands (NL, n = 501), Italy (IT, n = 502) and Germany (DE, n = 522). These countries were selected based on the importance of processed meat products and their national consumption levels. The total sample includes 2057 participants aged between 18 and 75 years.

Questionnaire and scaling

Attitudes towards meat products with chemical additives consisted of two distinct factors: (1) Preference for natural over chemical additives in food including meat (5 items, *e.g.* "Replacing chemical food additives with green tea extract makes meat products healthier") and (2) Perceived harmfulness of chemical additives (3 items, *e.g.* "Meat products containing chemical food additives are harmful to human health").
Involvement in meat products was measured based on four factors: Pleasure value (6 items, *e.g.* "Meat is very important to me"), Symbolic value (3 items, *e.g.* "My choice of meat gives other people an image of me"), Risk importance (3 items, *e.g.* "I would find a bad choice of meat terrible") and Risk probability (2 items, *e.g.* "I never know if I make the right choice of meat") [17]. Attitudes towards innovation in food were measured by 6 items of the domain specific innovativeness scale (DSI-scale) (*e.g.* "I buy new foods before other

people do") [15]. General health interest was measured by 8 items (*e.g.* "The healthiness of food has little impact on my food choices") [16].
Consumer attitude towards the new meat products wNCrN was measured by asking their agreement with the statement "New meat products with natural compounds and reduced nitrite are healthy / of high quality / safe / nutritious / tasty". Purchase intention towards the new meat products wNCrN was measured by means of three items (*e.g.* "I plan to try these new meat products with natural extracts instead of nitrite in the future") [18]. Prior to answering the questions related to attitude and purchase intention, participants were introduced to the concept of the new meat products wNCrN: "Imagine there are some new meat products, in which natural compounds originating from fruits and vegetables (henceforth, named "natural compounds") are added, and in this way, the food additive nitrite can be partially replaced." All the items mentioned were measured on a five-point interval scale. Socio-demographics were assessed at the end of the questionnaire.

Statistical analyses

Data were analyzed with SPSS Statistics 22.0. First, Cronbach's alpha coefficients were computed to assess the internal consistency of the scales. Second, factor analysis was performed to determine the relationships among items measuring the same concepts. Third, consumer segmentation based on consumers' attitude and purchase intention towards the new meat products wNCrN was done through cluster analysis. Lastly, multivariate regression analysis was performed to explain consumers' purchase intention by means of various personal characteristics. The robust bootstrap method was used to account for issues of non-normality and heteroscedasticity.

III. RESULTS AND DISCUSSION

Consumers' attitude and purchase intention towards the new meat products wNCrN were generally favourable ($\mu = 3.39 \pm 0.71$ and $\mu = 3.56 \pm 0.79$ on five-point scales, respectively); and significantly and positively correlated (Spearman's rho = 0.486, *p*-value <0.001). Based on the two segmentation criteria, *i.e.* attitude and purchase intention, a four-cluster solution was determined

as the optimal number of clusters. Segment 1 "Enthusiasts" accounted for 39.3% of the sample and included consumers who reported the highest mean score for attitude and purchase intention. Participants from Belgium accounted for the largest proportion of "Enthusiasts". Segment 2 "Accepters" included 11.9% of the sample, in which the participants had a strongly positive attitude but moderate level of purchase intention. Participants from Germany accounted for the largest proportion of "Accepters". Segment 3 "Half-hearted" (42.3% of the sample) included participants who had moderate levels of attitude and purchase intention. Segment 4 "Uninterested" (6.5% of the sample) referred to consumers with low levels of attitude and purchase intention. Participants from Italy accounted for the largest proportion of the "Uninterested" (Figure 1).

Figure 1. Positioning of the four segments based on mean values for attitude and purchase intention towards new meat products wNCrN
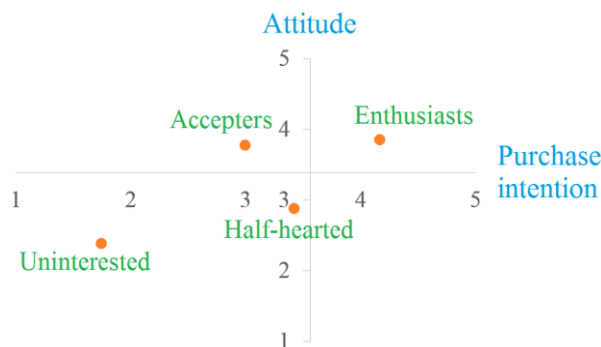
Moving along the groups from "Uninterested" to "Half-hearted", then to "Accepters" and "Enthusiasts" indicates an increase in consumer interests in the new meat products wNCrN. Based on the segmentation, consumer interest was higher among participants with a higher educational level, better perceived financial situation and among people having more frequent health check-ups.

A linear regression model was estimated to explain the relationship between purchase intention towards the new meat products wNCrN and personal characteristics. The resulting model accounted for 31.7% of the variance in the reported purchase intention (Table 1).

Table 1 Linear regression model for reported purchase intention towards the new meat products wNCrN

Variables entered	β
Attitude towards the new meat products wNCrN	0.395**
Preference for natural over chemical additives in food including meat	0.135**
Italy (dummy)	-0.121**
Perceived harmfulness of chemical additives	0.118**
Risk importance	0.113**
Germany (dummy)	-0.111**
Attitude towards innovation in food (DSI score)	0.086**
General health interest	0.066*
Education level	0.046*
Processed meat product consumption frequency	0.044*

** $p \leq 0.001$; *$p < 0.05$ based on robust bootstrap method
β: standardized coefficient

Attitude towards the new meat products wNCrN was the main driver for European consumers' purchase intention. Consumers who had a more positive attitude had a higher level of purchase intention. The standardized regression coefficient (β) indicates that the effect of attitude was almost three times greater than the second factor in the model. Other consumer characteristics having positive effects on purchase intention were: higher levels of preference for natural over chemical additives in food including meat, perceived harmfulness of chemical additives, risk importance, attitude towards innovation in food (DSI score), general health interest and processed meat product consumption frequency (in decreasing order of importance). These results were largely consistent with expectations. The level of purchase intention was higher with higher educational level. Compared to consumers in Belgium, consumers from Italy and German reported a lower level of purchase intention. Other socio-demographics variables did not have significant effects when simultaneously accounting for the aforementioned effects.

IV. CONCLUSION

The processed meat market segmentation yielded four consumer segments, which differ significantly in personal characteristics. Communication can thus be tailored according to the target segments. As attitude is the main driver for purchase intention, "Accepters" and "Half-hearted" can be primary targets of interests. Since "Accepters" have positive attitudes, marketing and

communication efforts stimulating trial (*e.g.* product sampling) can enhance their future purchase intention. For "Half-hearted", their attitude can be made more positive through providing more extended information such as advertisements or product labelling that highlights the benefits of the new processed meat products wNCrN.

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